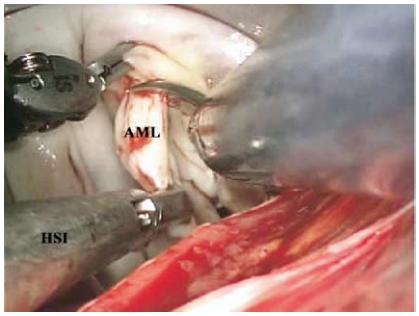

Figure 2. Excision of accessory mitral leaflet *(AML)* with assistance of handheld shafted instrument *(HSI)*.

sive surgical method to approach intracardiac lesions, such as the accessory mitral valve described here, it can be technically challenging. The use of the da Vinci system offers a stable instrument platform coupled with stereoscopic vision at surgical sites deep within the thorax. Surgical manipulations with the mechanical robotic instruments are facilitated by handheld shafted instruments inserted by the patient-side assistant through an adjacent service port. Placing the service port between the instrument arms and lateral to the endoscope port allows both the patient-side assistant and the console surgeon to work simultaneously at the intracardiac operative site. The da Vinci Robotic System might facilitate an endoscopic approach to lesions of the left ventricular outflow tract.

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Neonatal stenotic Ebstein's anomaly: A novel technique of right ventricular exclusion

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A 16-day-old baby with stenotic Ebstein's anomaly underwent an emergency operation to relieve progressive hypoxia, which was unresponsive to prostaglandin E_1 infusion and nitric oxide inhalation. Preoperative cardiac magnetic resonance imaging showed severe enlargement of the right cardiac chambers compressing the bilateral lungs (Figure 1). Operative findings showed a hugely dilated right atrium; a large, thin-walled atrialized right ventricle (aRV); and normal size and branching pattern of the pulmonary arteries. After aortic and bicaval cannulation through a median sternotomy, the ductus was divided, and cardioplegic solution was administered. Septal and posterior leaflets of the tricuspid valve were distally displaced down to the right ventricular outflow tract. The anterior leaflet was adherent to the right ventricular anterior free wall, leaving a small functional right ventricle (fRV) in the right ventricular outflow tract. There was a small opening (5 mm in diameter), or displaced tricuspid valve mechanism, between the aRV and the fRV. Given the severe wall thinning of the aRV and the small-sized fRV, biventricular repair was deemed unattainable. After the atrial septum was widely excised, the pulmonary and tricuspid valves were closed primarily. The tricuspid sac was suture obliterated from the apex to the base by suturing the right ventricular free wall to the septum, leaving the area 10 mm apart from the membranous septum to avoid injury of the conduction pathway (Figure 2). Once the right atrium was closed and the heart was reperfused, a 3.5-mm polytetrafluoroethylene vascular graft was interposed between the innominate artery and the main pulmonary artery. Cardiopulmonary bypass and aortic crossclamping times were 192 minutes and 71 minutes, respectively. The baby was extubated

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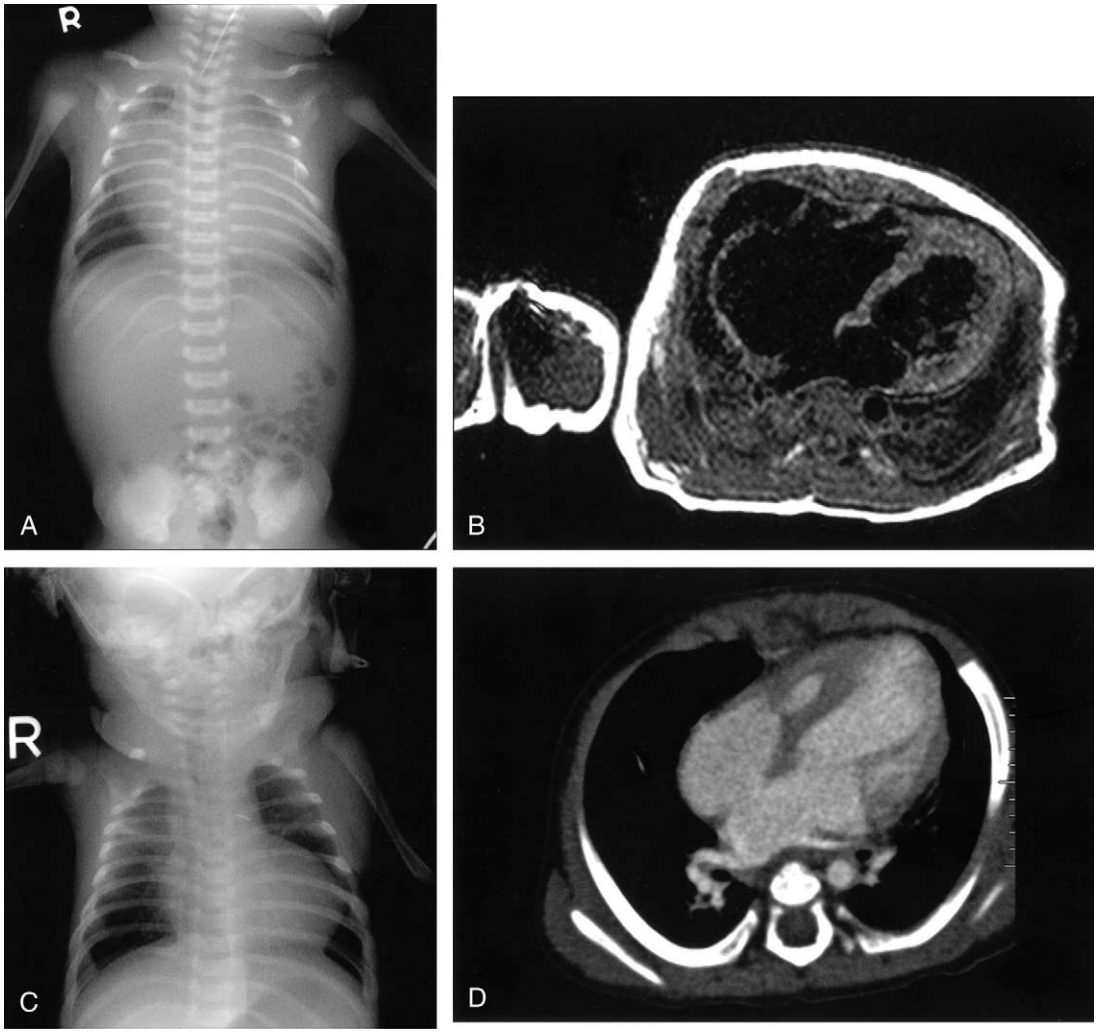

Figure 1. Preoperative chest x-ray (A) and cardiac magnetic resonance image (B) showing severe cardiomegaly with a huge right atrium and atrialized right ventricle. Postoperative chest radiograph (C) and cardiac computed tomogram (D) at 6 months postoperatively showing decreased heart size and an effectively obliterated atrialized right ventricle.

on postoperative day 8 and discharged on postoperative day 17. After 6 months of follow-up, the patient was readmitted and underwent bidirectional cavopulmonary shunt uneventfully. Chest computed tomography before bidirectional cavopulmonary shunt showed decreased right atrial size and obliterated aRV, which resulted in the compensatory growth of the lungs on both sides (Figure 1).

Discussion

It is generally believed that approximately 10% of patients with Ebstein's anomaly are not amenable to biventricular repair. After being introduced in 1991[1] and followed by several case reports,[2-5] the Starnes operation has been regarded as the procedure of choice for neonatal stenotic Ebstein's anomaly. The original Starnes procedure, however, has several pitfalls: the need for a prosthetic patch to close the tricuspid annulus, the risk of systemic thromboembolism of the prosthetic materials filled in the tricuspid sac, the risk of conduction injury on suturing the patch along the tricuspid valve annulus, and exposure of the coronary sinus to high pressure when it is left beneath the right ventricular exclusion patch. Our technique of right ventricular exclusion is simple and safe in that (1) it avoids the use of foreign materials, (2) it preserves the conduction pathway, and (3) it leaves the coronary sinus draining to the right atrium. Furthermore, it can be inferred from this case that effective reduction in the size of the right ventricle, as well as the right atrium, might be important to

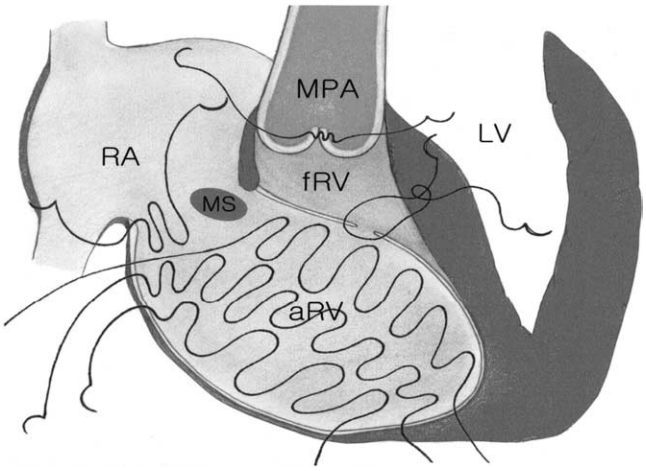

Figure 2. Schematic illustration showing the novel technique of atrialized right ventricle obliteration. *RA*, Right atrium; *MS*, Membranous septum; *aRV*, atrialized right ventricle; *fRV*, functional right ventricle; *MPA*, main pulmonary artery; *LV*, left ventricle.

promote the appropriate growth of the once-hypoplastic lungs, which are compressed preoperatively by the severely enlarged right cardiac chambers in Ebstein's anomaly.

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Combined atrial arterial switch operation (double switch) for hearts with Shone syndrome and pulmonary hypertension

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After relief of obstructive lesions in Shone syndrome, left ventricular dysfunction might persist, with high left ventricular end-diastolic pressure (LVEDP) and pulmonary hypertension (PHT).[1] We reasoned that the right ventricle (RV), having been trained by means of PHT, could support the systemic circulation. The left ventricle (LV), although dysfunctional in the systemic circulation, would be adequate to support the pulmonary circulation. With this arrangement, PHT might resolve. This was achieved in 2 patients with the combined atrial and arterial switch procedure (double-switch procedure), which is usually used in congenitally corrected transposition.[2]

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Clinical Summary

PATIENT 1. An 18-month-old boy (7.5 kg) with Shone syndrome and previous coarctation and parachute mitral valve repair presented with failure to thrive and PHT. His aortic valve was bicuspid. Preoperative evaluation showed severe mitral regurgitation and a non–apex-forming LV with endomyocardial fibroelastosis, although its end-diastolic diameter was normal (25 mm; predicted range, 21-31 mm). LVEDP was 17 mm Hg. Pulmonary artery (PA) pressures were 120/70 mm Hg (mean, 85 mm Hg), decreasing to 65/50 mm Hg (mean, 45 mm Hg) with increased inspired oxygen. Systemic pressures were 95/60 mm Hg.

A double-switch procedure was performed. A supravalve ring was excised from the mitral valve, and its anterior commissure was partially closed. A 13-mm pulmonary homograft was placed in the native aortic root (neopulmonary outflow tract) because coronary artery mobilization necessitated partial excision of the bicuspid aortic valve. Postoperative course was